RANGER 'RITHMETIC

for
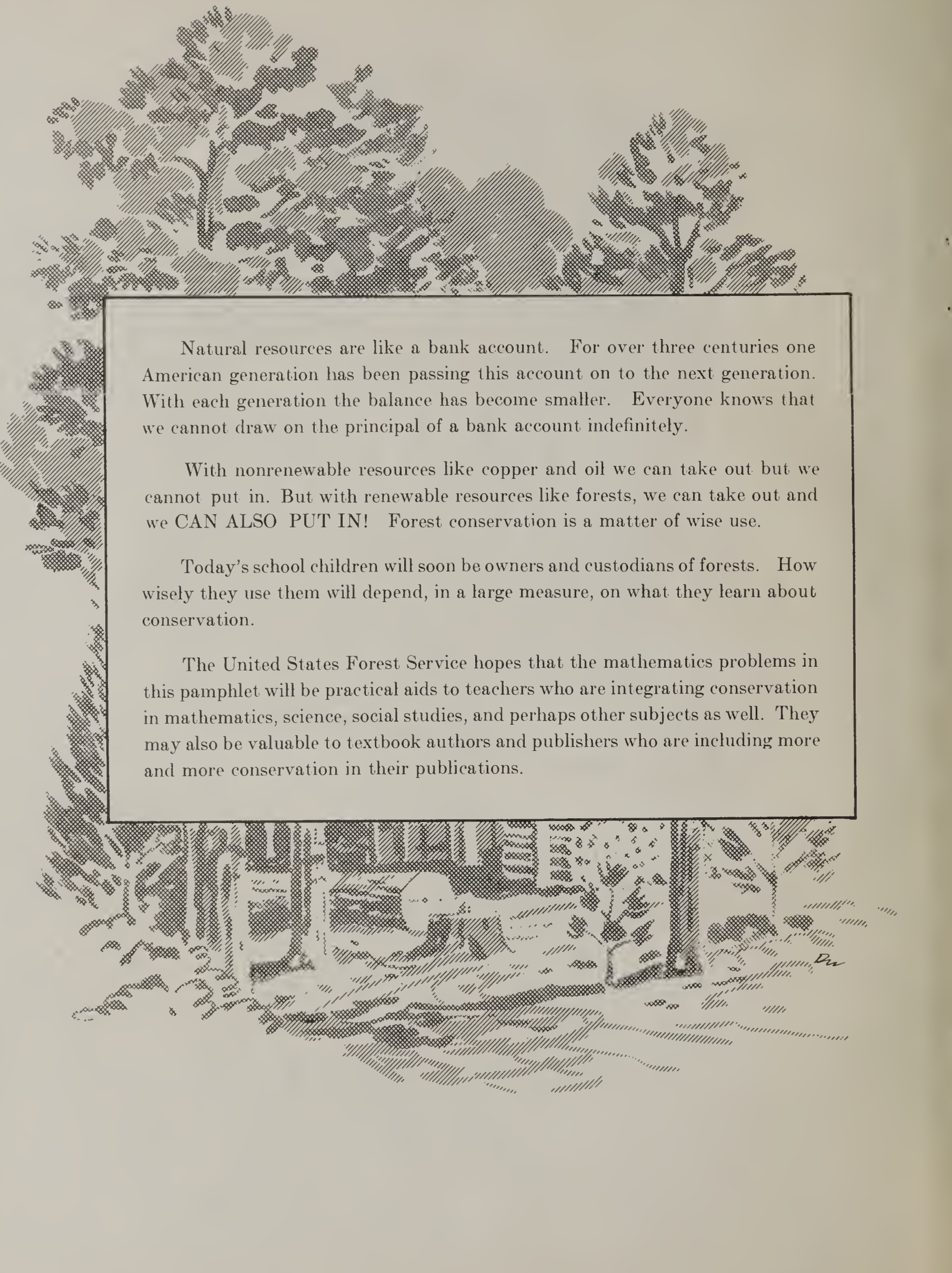
SEVENTH GRADE TEACHERS

U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

Washington, D. C.

Natural resources are like a bank account. For over three centuries one American generation has been passing this account on to the next generation. With each generation the balance has become smaller. Everyone knows that we cannot draw on the principal of a bank account indefinitely.

With nonrenewable resources like copper and oil we can take out but we cannot put in. But with renewable resources like forests, we can take out and we CAN ALSO PUT IN! Forest conservation is a matter of wise use.

Today's school children will soon be owners and custodians of forests. How wisely they use them will depend, in a large measure, on what they learn about conservation.

The United States Forest Service hopes that the mathematics problems in this pamphlet will be practical aids to teachers who are integrating conservation in mathematics, science, social studies, and perhaps other subjects as well. They may also be valuable to textbook authors and publishers who are including more and more conservation in their publications.

Problem No. 1

In 1947, the tussock moth threatened to destroy 413,469 acres of Douglas-fir forests in Idaho, Washington, and Oregon. However, prompt airplane spraying with DDT saved those forests and probably the jobs of thousands of people at a cost of $1.57 per acre: How much was the total cost?

Answer: $649,146.33

Insects and diseases cause more damage to forests each year than do forest fires.

Problem No. 2

In planting forest trees, about 1,000 trees are usually planted on each acre. The white pine, a tree common to the Northeast, averages about 27,000 seeds per pound. If 1 pound of seed is planted in a forest tree nursery and 64 percent of the seeds grow, how many acres of forest land can be planted with these white pine trees when they are taken from the nursery?

Answer: 17.28 acres

In the United States, most trees for planting idle forest acres are raised in State tree nurseries. Ask your State forester about the nurseries in your State.

Problem No. 3

A farmer owns six tourist cabins built of logs from the surrounding national forest. Tourists who come to the national forest for vacation and rest may rent these cabins for $1.65 per night per person. If two people stay in each of the six cabins for a period of 1 week, how much money does the farmer get from his cabins for that week?

Answer: $138.60

Most people who visit the national forests use them carefully. However, a few break tables, damage fireplaces, leave cans and garbage on the ground, and otherwise destroy property and beauty. Such people spoil the pleasure of others. Their thoughtlessness costs the people of the United States large sums of money each year.

Problem No. 4

Range studies show that in some parts of the Southwest as much as 432 cubic feet of soil per acre is being eroded away each year because of overgrazing and range decline. How many cubic yards of soil would be lost to erosion each year on 2,000 acres of such land?

Answer: 32,000 cubic yards

On the national forests, the aim is to allow only the number of animals to graze that will not injure the plant cover or compact the soil.

Problem No. 5

Between 1934 and 1942 the United States Forest Service cooperated with farmers in the Great Plains to plant thousands of miles of trees in strips. These strips are called "shelterbelts" because they protect farm soil and crops from strong winds. After 7 years the trees in North Dakota averaged 16 feet in height, those in Nebraska 20 feet, and in Texas the trees were 24 feet high. What is the average annual growth in height (ignoring height when planted) for shelterbelt trees in North Dakota? Nebraska? Texas?

Answer: North Dakota_____ 2.29 feet
Nebraska_____ 2.86 feet
Texas_____ 3.43 feet

Cultivated or bare soil, when unprotected from strong winds, is often subject to "wind erosion." That means the soil is either moved or blown away. Land, crops, and homes are damaged; people are stranded on unproductive farms. And the blown-away soil does damage where it is deposited.

Problem No. 6

There are 4,200,000 small forest ownerships in the United States and 97 percent of them are east of the Great Plains. How many are east and how many are west of the Great Plains?

Answer: 4,074,000 east
126,000 west

Small forests are the greatest part of our forest problem because there are so many of them and because the owners are often indifferent toward good care of them.

Problem No. 7

In one year, 3,321,993 sheep and 1,153,246 cattle grazed on the national forests. The livestock owners paid Uncle Sam 11 cents per month for each sheep and 49 cents per month for each head of cattle. If each animal grazed for 3 months, how much did the stockmen pay for using the national forests for grazing their livestock that year?

Answer: $1,096,257.69 for sheep
1,695,271.62 for cattle
$2,791,529.31

The Forest Service makes no charge for calves and lambs less than 6 months old which graze with their mothers on the national forests.

Problem No. 8

Forest litter is made up of leaves and branches that drop to the ground from trees and other plants. This litter protects the soil and helps keep it porous so it can absorb a lot of water. The porous soil on 1 acre of a well-protected forest absorbed $226\frac{1}{2}$ tons of water. How many tons of water would 1 square mile of this same forest land absorb?

Answer: 144,960 tons of water

By absorbing rain water, land well covered with trees helps to control floods.

Problem No. 9

During one recent year there were about 200,000 forest fires in the United States. Ninety percent of them were caused by people's carelessness—70,000 were caused by smokers alone. If everyone had been careful, how many forest fires would there have been that year?

Answer: 20,000

Remember—Only You Can Prevent Forest Fires!

Problem No. 10

The American Red Cross reports that between June 1920 and June 1940 there were 392 flood disasters in the United States in which the Red Cross carried on relief operations. What was the average number of flood disasters per year in the United States during that period?

Answer: 19.6 flood disasters per year

Soil which is well covered with trees, grass or other plants is like an immense sponge and holds much of the water that falls on it. But when fire or man or animals destroy this plant cover, rain or snow water rushes off the land to cause floods and soil erosion.

Problem No. 11

Clyde is making a book rack in his industrial arts class. He has a board 4⅞ inches wide which he wants to cut the long way so that both pieces are of exactly the same width. If he cuts it on a power bench saw which cuts ⅛ of an inch in sawdust, how wide will each piece be?

Answer: 2⅜ inches wide

An enormous amount of wood is wasted every year in turning trees into usable products. Continued research will show how to use this waste.

Problem No. 12

Jimmy learned that there are about 7,375,000 deer and 132,000 black bear in the United States. He asked a forest ranger how many deer live on the national forests. The ranger told him 29 percent. When he figured it out, how many deer did Jimmy find live on the national forests?

Answer: 2,138,750 deer
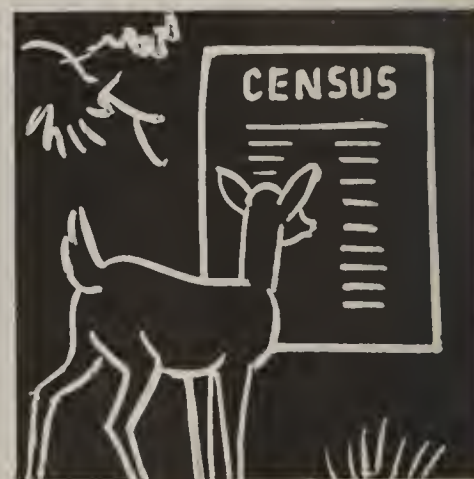
Providing food and shelter for wildlife is just one of the many uses of the national forests.

Problem No. 13

Wilderness areas, wild areas and roadless areas within the national forests are set aside to preserve primitive conditions of wild land. Roads, resorts, camps, summer homes and commercial logging are not allowed. There are 77 such areas totaling about 14,014,000 acres of national forest land. What is the *average* number of acres in each area?

Answer: 182,000 acres

Many people visit national forest wilderness areas and wild areas to see what America looked like in the beginning and to enjoy a quiet vacation. There aren't many other places in our country where that can be done.

Problem No. 14

345,000,000 acres of our commercial forest land is privately owned. About 40 percent of it is owned by farmers; 35 percent by other small owners; and 25 percent by large owners. How many acres are in each kind of ownership?

Answer: farmers_____ 138,000,000 acres
other small owners_____ 120,750,000 acres
*large owners_____ 86,250,000 acres*

Generally speaking, the lands best suited for growing timber in the United States are in private ownership. However, most of these lands are not producing as much timber as they should.

Problem No. 15

A Girl Scout troop has a triangular piece of forest land for its camp. If the land has a base of 540 feet and an altitude of 300 feet, how many square feet does it contain?

Answer: 81,000 square feet
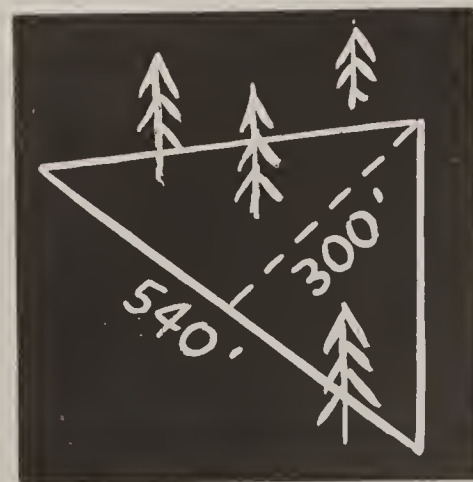
Girl Scouts, Boy Scouts, 4-H boys and girls, Campfire Girls and other young people's organizations have helped establish school and community forests. If you want to establish a forest for your school or community, ask the nearest forester or county agent for advice.
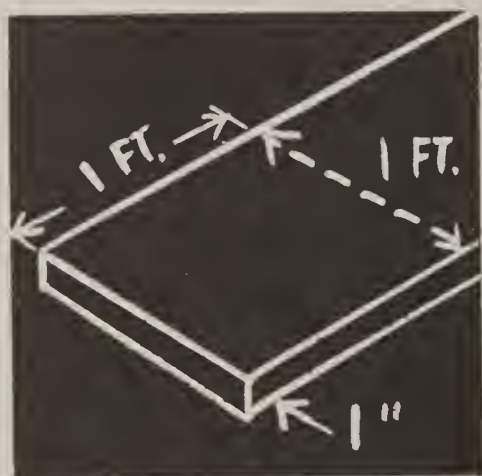
Problem No. 16

Each year more and more people are using the national forests for recreation, both summer and winter. A ski tow on a national forest in the White Mountains of New Hampshire is three-eighths of a mile long. How many feet long is the tow? Rods?

Answer: 1,980 feet
120 rods

The "Farthest South" ski area in the United States is in the Chiricahua Mountains of the Coronado National Forest near the Arizona-Mexico Border.

Problem No. 17

Mr. Davis bought 26,496 board feet of lumber and 2,000 red bricks for the new house he will build. (Lumber is measured in board feet and 1 board foot is a piece of wood 1 foot square × 1 inch thick.) If lumber costs $69 per thousand board feet, how much is the total bill for lumber?

Answer: $1,828.22

When a carpenter speaks of "Hardwoods" and "Softwoods," what is he talking about? In a broad way, hardwood lumber generally comes from trees which lose their leaves in fall—maple, oak, ash and gum, for example; softwood lumber comes from evergreen trees like pine, spruce, fir, and cedar which keep their leaves (needles) all year 'round.

Problem No. 18

There are 461,000,000 acres of commercial forest land in the United States. Of this amount, 345,000,000 acres are owned by private individuals. What percent of our forest land is privately owned?

Answer: 74.8 percent

In the United States, most of the lumber, pulpwood, and other forest products are cut from forest land in private ownership.

Problem No. 19

Each of the 152 national forests is divided into districts. In charge of each district is a forest ranger. There are about 800 district rangers. Approximately 24,000,000 people visit the national forests each year. If these visitors were equally divided among the ranger districts, how many forest guests would each ranger have on his district in a year?

Answer: 30,000 forest guests on each district per year

There are 50,000 miles of roads in the national forests. Practically all of them are open to the public.

Problem No. 20

One New Year's Day a heavy rain fell on a steep western mountain which had been heavily burned by a forest fire. There was little plant cover to help hold back the water and keep it from flooding the town below. Damage by the flood which followed the rain amounted to $5,000,000. If 4,000 people lived in the town, how much would this damage be per person?

Answer: $1,250 damage per person

Trees on this mountain would have helped keep the soil from washing down on the town below.

Problem No. 21

Two men built a camp fire in the forest and failed to put it out—Dead Out—before they went to their homes 7 miles away. Their carelessness caused a forest fire which burned 212 acres of timber. If the timber was worth $126.35 per acre, what was the total loss?

Answer: $26,786.20

Never leave a camp fire until every spark is out—"Dead Out!" Pour water on it as you stir up the coals. Then feel of it. If there is no heat, the fire is out.

"Figure this out—the United States has plenty of forest land, if well managed, to grow all its timber needs—yet it isn't growing as much sawtimber as it consumes."

Materials To Help Teach Forest Conservation

0–7 Forest Service Films—Catalog.   10 cents.   17 pages.

0–32 Suggestions for Integrating Forestry in the Modern Curriculum.   4 pages. A columnar chart showing how forestry can be integrated into the several subjects at the elementary, junior high school, and senior high school levels.

BULLETINS

AIB–91 The Work of the United States Forest Service.   10 cents.   22 pages. Emphasizes the responsibilities of the Forest Service and its far-flung activities in administering the 180,000,000 acres of national forests.   It describes Forest Service cooperation with the States, forest-land owners, ranchers, forest industries, and farmers, to insure a perpetual supply of timber and other vital products from our forests and rangelands.

MP–388 Living and Forest Lands.   10 cents.   47 pages.   A guide for study groups especially interested in the social and economic aspects of forests and forestry.   Contains suggested classroom activities, questions for discussion, problems, evaluation tests.

G–7 You and Forest Fires.   16 pages.   Shows that 90 percent of our forest fires are caused by man's carelessness and thoughtlessness.   Tells how they can be prevented.

L–282 Know Your Watersheds.   13 pages.   Facts about water.   It tells what we must guard against and what we can do to assure safer and more dependable water supplies.

POSTERS (Colored)

W–3 How A Tree Grows (16 by 21 inches).

D–5 What We Get From Trees (28 by 40 inches).

Single copies of the above items are free to teachers from United States Forest Service, Washington 25, D. C.   For quantity purchases of priced items, order direct from Superintendent of Documents, United States Government Printing Office, Washington 25, D. C., and enclose money order or check payable to Superintendent of Documents.

"I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country — its soil and minerals, its forests, waters and wildlife."